

WHAT IS CLAIMED IS:

1. A locomotion interface that provides input signals, indicative of a user's movement, to a virtual reality system, the locomotion interface comprising:
 - a pressure-sensing mat including a base layer, a plurality of pressure sensing elements formed over the base layer, a top layer formed over the plurality of pressure-sensing elements, and an input interface formed between the base layer and the top layer, wherein the plurality of pressure sensing elements output signals indicative of pressure applied to the top layer; and
 - a base structure coupled to the pressure-sensing mat, the base structure being fixed in a first position but freely moveable in a second position.
2. The locomotion interface of claim 1, wherein the base structure moves the pressure-sensing mat in all directions.
3. The locomotion interface of claim 1, wherein the pressure-sensing mat allows the user to move in one or more of at least a forward moving position, a backward moving position, a left side moving position, a right side moving position and a position therebetween.
4. The locomotion interface of claim 1, wherein the input interface comprises one or more radio-frequency communication interfaces.
5. The locomotion interface of claim 1, further comprising a housing that retains the pressure-sensing mat and the base.
6. The locomotion interface of claim 5, further comprising a plurality of casters disposed between the housing and the pressure-sensing mat, the casters allowing the pressure-sensing mat to move in the housing.
7. The locomotion interface of claim 5, further comprising:
 - a roller disposed in the housing, the roller being in frictional contact with the pressure-sensing mat;
 - a first motor that rotates the roller about a first axis; and
 - a second motor that rotates the roller about a second axis, the second axis being perpendicular to the first axis, wherein
 - the rotation of the roller generates thrust vectors that move the pressure-sensing mat in all direction.
8. The locomotion interface of claim 1, wherein the plurality of pressure-sensing elements make up a grid.

9. The locomotion interface of claim 1, wherein the plurality of pressure-sensing elements comprise force sensitive resistors.

10. The locomotion interface of claim 1, wherein the base layer comprises a semi-rigid material.

11. The locomotion interface of claim 1, wherein the base layer comprises plastic.

12. The locomotion interface of claim 1, wherein the top layer comprises rubber.

13. A virtual reality system comprising the locomotion interface of claim 1.

14. A virtual reality system that transposes a user's position and movement in real space to virtual space, the virtual reality system comprising:

a locomotion interface that outputs signals indicative of a user's position in real space, the locomotion interface including a pressure-sensing mat including a base layer, a plurality of pressure sensing elements formed over the base layer, a top layer formed over the plurality of pressure-sensing elements, and an input interface formed between the base layer and the top layer, the plurality of pressure sensing elements output signals indicative of pressure applied to the top layer, and a base structure around which the pressure sensing mat is disposed, the base structure being fixed in a first position but freely moveable in a second position;

a virtual reality processor that uses the signals output by the locomotion interface to produce an output indicative of the user's position in the virtual space corresponding to the user's position and movement in the real space; and

a display that uses the output from the virtual reality processor to produce an image of the virtual space.

15. The virtual reality system of claim 14, wherein the base structure moves the pressure-sensing mat in all directions.

16. The virtual reality system of claim 14, wherein the pressure-sensing mat allows the user to move in one or more of at least a forward moving position, a backward moving position, a left side moving position, a right side moving position and a position therebetween.

17. The virtual reality system of claim 14, wherein the display is a head mounted display.

18. The virtual reality system of claim 14, wherein the input interface comprises one or more radio-frequency communication interfaces.
19. The virtual reality system of claim 14, further comprising a housing that retains the pressure-sensing mat and the base structure.
20. The virtual reality system of claim 19, further comprising a plurality of casters disposed between the housing and the pressure-sensing mat, the casters allowing the pressure-sensing mat to move in the housing.
21. The virtual reality system of claim 19, further comprising:
 - a roller disposed in the housing, the roller being in frictional contact with the pressure-sensing mat;
 - a first motor that rotates the roller about a first axis; and
 - a second motor that rotates the roller about a second axis, the second axis being perpendicular to the first axis, wherein
 - the rotation of the roller generates thrust vectors that move the pressure-sensing mat in all direction.
22. The virtual reality system of claim 14, wherein the plurality of pressure-sensing elements make up a grid.
23. The virtual reality system of claim 14, wherein the plurality of pressure-sensing elements comprise force sensitive resistors.
24. The virtual reality system of claim 14, wherein the base layer comprises a semi-rigid material.
25. The virtual reality system of claim 14, wherein the base layer comprises plastic.
26. The virtual reality system of claim 14, wherein the top layer comprises rubber.
27. The virtual reality system of claim 14, wherein the virtual reality processor comprises:
 - a pattern generator that uses the signals output from the locomotion interface to generate a plurality of corresponding patterns;
 - a motion identifier that uses the plurality of patterns generated by the pattern generator to identify a corresponding plurality of user positions and user movements; and

a virtual environment renderer that uses the identified user positions and movements to generate a virtual space such that the user can effect, and be effected by, the virtual space.

28. The virtual reality system of claim 27, wherein the plurality of positions identified by the motion identifier comprise at least one of a prone user position, a crawling user position, and a standing user position.

29. The virtual reality system of claim 27, wherein the plurality of motions identified by the motion identifier comprise at least one of a backward user motion, a sideways user motion, a forward user motion, and a diagonal user motion.

30. A method of providing input signals, indicative of a user's movement, to a virtual reality system, comprising:

sensing pressure applied to a locomotion interface having a pressure-sensing mat including a base layer, a plurality of pressure sensing elements formed over the base layer, a top layer formed over the plurality of pressure-sensing elements, and an input interface formed between the base layer and the top layer, and a base structure around which the pressure sensing mat is disposed, the base structure being fixed in a first position but freely moveable in a second position.

31. The method of claim 30, wherein the base structure moves the pressure-sensing mat in all directions.

32. The method of claim 30, wherein the pressure-sensing mat allows the user to move in one or more of at least a forward moving position, a backward moving position, a left side moving position, a right side moving position and a position therebetween.

33. The method of claim 30, further comprising:

processing signals output by the locomotion interface, in response to the sensed pressure, to produce an input signal indicative of the user's position in virtual space corresponding to the user's position and movement in real space.

34. The method of claim 33, wherein processing the signals output by the locomotion interface comprises:

generating a plurality of patterns that correspond to the signals output by the locomotion interface; and

identifying a plurality of user positions and user movements that correspond to the plurality of patterns.